From Ashurbanipal to Plato:

Religion and Naturalism in Ancient Science

I

Lucretius praised Epicurus for releasing humans from the oppressions of religion. Earlier, human life had lain *oppressa gravi sub religione*, "crushed by the weight of religion" in Cyril Bailey's rendering. Lucretius adds in III. 30 that nature, through the power of Epicurus, "has been made clear, laid bare to sight on all sides."

The atomic theory of Democritus provided the foundation for Epicurus' philosophy. The Greek inquiry into nature, beginning in the 6th century BCE culminated in ancient atomism. Gregory Vlastos noted that the atomists provided "the first rigorously mechanistic conception of the order of nature," adding that its abandonment by Plato marked one of "the great turning points in European natural philosophy."[1] This philosophical narrative connotes a secularizing shift up to the time of Plato. It is a Whiggish reading: religion and myth are forsaken, rationalism embraced.

II

Atomism's programmatic objectives originated with the Milesian *physiologoi* who sought rational explanations for phenomena throughout the universe. Their investigations ran 'from the heavens above to beneath the earth,' as the misdirected indictment of Socrates said. But how deeply did rationalism run? Discounting Thales, about whom little is known, we should turn to the more significant figure of Anaximander. He was likely the first author to abandon poetry for prose (though some scholars, relying on a report in Theopompus, accord this honor to Pherekydes of Syros).[2]

The format of Anaximander's work is unknown, though we are told that Heraclitus compiled a *sungramma* or *biblion*. Significantly, early philosophical writings were identified with individuals rather than rooted in an impersonal tradition. Hesiod identifies himself as poet of the *Theogony*. Hecataeus of Miletus whose *floruit* was about 500 BCE, introducing his *Genealogiai* or *Historiai* named himself as the author and added, "I write these things, as it seems to me to be true."[3]

A close association holds between nature and the divine in the thinking of the early writers. Hesiod is forthright about this; when Anaximander according to Aristotle [*Physics* 203b6] called the *Apeiron*, his originating cosmic principle, "immortal and indestructible" he used terms normally associated with divinity. A recent interpreter states that Anaximander "comes close to formulating in the form of his first principle…a transcendent or supercosmic deity."[4] Nevertheless an influential interpretive tradition, going back at least to Burnet's *Early Greek Philosophy*, rejects any imputation of theology in favor of resolute secularism among the Ionians. Gregory Vlastos insisted that the Ionians' "primary object is to understand nature, not to reform religion."[5]

The greatest achievement of Anaximander lies in speculations on the structure and dynamics of the cosmos. Proper historical perspective on Anaximander is found in Near Eastern astronomical sciences of the 7th century and 6th centuries BCE, specifically with the Astronomical Diaries of Ashurbanipal (reigned 669–ca. 631 BCE) meant to support the understanding of omens. These documents build upon Babylonian practice of nightly observations of the sky, standard since the 8th century BC. Thousands of tablets exist, so many that whatever the astronomical data, priestly whims became the final determinant in interpreting a myriad of potential situations.[6] Sophisticated mathematical and astronomical details comprise the dairies which aid priests interpreting celestial phenomena.

Until the modern period little meaningful distinction could be found between what we classify today as astronomy and astrology. The difference, according to one recent writer, was "strictly a matter of convenience:"[7]

> astronomical cuneiform texts, including the predictive and tabular as well as the observational and nontabular, were…products of a particular intellectual tradition that encompassed other astral sciences, such as celestial divination, personal horoscopy, and astral magic.[8]

Historians of science seek to exclude anything suggestive of “the sacred” from accounts of the history of science though scholars are increasingly receptive to a more inclusive approach. Francesca Rochberg endeavored to place

> Babylonian celestial inquiry, particularly with respect to celestial divination and horoscopy, within the history of science in a broader context. The cuneiform mathematical astronomical corpus, taken in isolation, is readily classifiable as scientific for its quantitative and predictive character [and] its firm empirical foundations. …[but occur] within the range of activities of a class of scribes whose interests also included celestial divination and horoscopy.[9]

Moreover, the founders of modern science and astronomy, Copernicus and Kepler, relied on religious and mystical motives for their ground-breaking theories. Copernicus’ heliocentrism elaborated the “symbolic identification of the sun and God”[10] common in Renaissance literature. In “On the order of the heavenly bodies” (1453) Copernicus wrote

> In the middle of all sits the Sun enthroned. In this most beautiful temple could we place this luminary in any better position from which he can illuminate the whole at once? He is rightly called the Lamp, the Mind, the Ruler of the Universe.[11]

Neoplatonism had a powerful impact on “Copernicus’s attitude toward both the sun and mathematical simplicity.”[12] Kepler likewise was a Neoplatonist and, defending Copernicus in his *Mysterium Cosmographicum* (1596), relied on “mathematical harmonies and …faith in the causal role of the sun.”[13] For Kepler, mystic attributes and physical powers alike lie in the sun:

> The sun in the middle of the moving stars, himself at rest, and yet the source of motion, carries the image of God, the Father and Creator…
> Geometry existed before the Creation, is co-eternal with the mind of God, *is God himself*.[14]

Plotinus in *The Enneads* had said that “we may think of the stars as letters perpetually being inscribed on the heavens or inscribed once for all.”[15] For the Babylonians as for Kepler, the stars and their patterns presented “a celestial script.”[16]

Tension between natural philosophy and religion reflects a historically limited definition and classification of the sciences originating with Bacon. On this view the Greeks invent nature and the natural sciences.[17] However, Babylonian astronomical diaries go far beyond the shepherd’s lore of Hesiod’s *Works and Days*. The Babylonian contents track long periods of time with sophisticated astronomical observations, including the lunar crescent marking the beginning of the month; whether the length of the preceding month was 29 or 30 days; a record of the moon passing certain stars and the degree of difference between the moon and given stars; the same information for the "wandering stars" or planets; the dates and length of time the planets were visible; extremities and mid-points of planetary orbits; also recorded are variable phenomena including eclipses, comets and meteor showers. Other data are provided: meteorological events, agricultural prices, the rise and fall of the Euphrates, and important historical occurrences. The extensive period of observations, and the recording and preservation of the information, allowed the Babylonians by the 6th century to compute the intervals between sunrise and sunset for months ahead and to calculate the 8 year Venus cycle, the 12 year Jupiter cycle, and the lunar-solar period of 19 years, eventually called the Metonic cycle by the Greeks.

III

It is not secularism, however, or the freedom of early Greek inquiries from service to priestly functions, that distinguishes them from the achievements of the ancient Near East. The primary factor separating the two traditions is the Greek search for explanation.

Plato's *Epinomis* holds that Babylonian astronomical findings came to the Greeks via Egypt. Aristotle stated that "observations over very many years of the occultations of stars by planets had been made by Egyptians and Babylonians 'from whom we possess much sound knowledge concerning each of the planets.'"[18] The Greeks did not attain the level of technical sophistication evident in 7th and 6th century BC Babylonian science and mathematics until late in the Hellenistic period. Yet the narrative of Western science judges Anaximander's account of the cosmos a major advancement over Ashurbanipal's empirically sophisticated astronomical diaries. This is despite the fact that the diaries offered predictive value that no Milesian could approach. A comparison of the Copernican to Ptolemaic systems is pertinent: despite Copernicus' theoretical achievement, contemporaries searching for specific astronomical data were better served by Ptolemy's *Almagest*. Greek cosmologists are credited with developing a kinematic account of the heavens, a *theory* of the *kosmos*. Charles Kahn, the author of the standard account of Anaximander notes that Anaximander seeking to describe a universe governed by law, turned to abstract principles of symmetry.[19] Symmetrical ratios based on three relate the earth's diameter to its height. The spheres of the stars, the moon, and the sun were likewise expressed in multiples of three, in a greatly simplified but elegant form of mathematical astronomy.

The achievements of Babylonian mathematics and astronomy have scarcely gone unnoticed, but the Ionians receive the accolade for inaugurating an intellectual revolution. How should we read such different valuations? There is undoubtedly more than one way to approach that question, but if a single word suffices it would be *theory* and the high value the modern West has put on that accomplishment. Thus Miletus became the birthplace "of a rational outlook on the natural world."[20]

The empirically minded and omen seeking Babylonians were not motivated to search for mathematical insights of the sort developed by Anaximander whose geometrical approach puts him at the beginning of the Western trajectory to the heliocentric hypothesis[21] and rank him among "the creators of a rational science of the natural world."[22] Geoffrey Lloyd praises the Babylonians for applying mathematics to complex astronomical phenomena but notes a failure "to construct geometrical models of the movements of the heavenly bodies"[23] until coming under the influence of Greek astronomy. A similar contrast holds in the case of geometry whose Egyptian and Babylonian practioners never developed a notion of proof. Comparison of the Pythagorean theorem and the Babylonian tables approximating the length of the irrational hypotenuse of a triangle demonstrates this point.

IV

The Ionian philosophy of nature had the far reaching goal of providing a uniform account of all phenomena including social. Free of priestly direction, Greek thinkers set out to investigate and codify useful knowledge. The detail and comprehensiveness offered by the atomists marked the apogee of the *physiologoi* tradition. An openness to critique was as important as theory. Edmund Husserl observed that along with theory a new praxis arose, the

> universal critique of all life and all life-goals, all cultural products and systems that have already arisen out of the life of man [24]

Two examples suffice here: medicine and rhetoric. The Hippocratic corpus spurred the formation of *technai* in the tradition of Ionian natural philosophy. The treatise "On regimen" states the need for anyone treating the human regimen to

> first acquire knowledge and discernment of the nature of man in general – knowledge of its primary constituents and discernment of the components by which it is controlled. For if he is ignorant of the primary constitution, he will be unable to gain knowledge of their effects; if he be ignorant of the controlling thing in the body he will not be capable of administering to a patient suitable treatment.[25]

The codified *technai* of the Hippocratic treatises are a new form of scientific literature which would have been impossible under the hieratic setting of the ancient Near East. In Greece the autonomy of the writer's views is asserted as we saw above. Often that autonomy requires validation through argument, whether stridently as by Heraclitus, or deductively as in the chain of reasoning in Parmenides' poem. The author of the Hippocratic treatise quoted earlier notes his critical awareness of other opinions.

> The correct statements of my predecessors it is impossible for me to write …in some other way; as to the incorrect statements, I shall accomplish nothing by

> exposing their incorrectness. If however I explain how far each of their statements appear to me correct I shall set forth my wish….Accordingly …I shall accept correct statements and set forth the truth about those things which have been incorrectly stated. I shall also explain the nature of those things which none of my predecessors has even attempted to set forth.[26]

Another example is the *Dissoi Logoi*, a treatise on argument written about 400 BCE, containing nine independent arguments for and against the identity of apparent opposites. Methods of argument might be turned against anything proposed as true, as Protagoras holds in his Art of Eristic Argument. Goals of the *Dissoi Logoi* include presenting the knowledge needed by speakers and politicians. The author writes:

> I consider it a characteristic of the same man and the same art to be able to converse in brief questions and answers, to know the truth of things, to plead one's cause correctly, to be able to speak in public, and to have an understanding of argument skills, and to teach people about the nature of everything –both how everything is and how it came into being.[27]

The importance of examination and inquiry manifest the cult of rationality typical of the period. The need for wisdom becomes pervasive. Peter Schulz writes

> Everywhere attempts were made to subject human action/experience in all its manifestations to rational norms, with the result that empiricism gave way to artificial rules. …Practices which had been handed down were subjected to examination, exposed as random regulations, and new instructions for correct action written down….rational rules for all situations were aimed at.[28]

The intellectual climate that developed out of the *historiai* or inquiries in Miletus eventually put a premium on three practices: engagement with conflicting opinions; emphasis on proof and argument; and frequent focus on the first-person in presenting the argument.[29]

V

Let us now note the effect of scientific literature and *technai* on Plato and Plato's role in developing the same. In doing so I will make use of the notion of "culture of knowledge" as described in *Ideal and Culture of Knowledge in Plato*.[30] There are three components to the culture of knowledge in Plato. First, the ways of teaching and learning through establishment of a tradition and techniques. Secondly, epistemic and pedagogical practices that bring one to a state of knowledge. And thirdly, some notion of what the ideal of knowledge would be.[31]

I will examine only the third of these since the first two are evident already in examples above from the Hippocratic and sophistic writers. Plato devotes a great deal of time to establishing criteria of knowledge. He is at odds with modern epistemologists who focus on conditions of justification for epistemic statements. Parmenides provides an example of the Greek approach, which is to establish criteria an *object* of knowledge must fulfill if it is to be knowable and a genuine object of knowledge.

Plato also has a set of "methodological standards and a … concept of what proper objects of knowledge are."[32] The elenchic or aporetic dialogues show Socrates at work articulating these criteria. Socrates does gradually mark out criteria despite the aporetic nature of some dialogues. Stability is most important, which the world of flux denies us. Along with stability comes incorrigibility of the *logoi* which account for the entity in question. The *Laches* is a good example. The search for what courage is seems to make little headway, not surprising when the most skilled of Socrates' interlocutors is Nicias, renowned for his disastrous capitulation to superstition at Syracuse. Yet near the close of the dialogue, Socrates extracts the concession that the definition of courage must be free of all temporal contingency. hese epistemic criteria are not feasible for mortal beings, those whom Pindar called but the shadow of dream.

Only in the transcendent realm of the forms can we find genuine explanation, as Socrates details in the *Phaedo*. No physicalist account, you will recall, explains *why* the bones and flesh of Socrates languish in an Athenian prison.

Like the deathless and indestructible *apeiron* of Anaximander, Plato's forms have characteristics of divinity. To grasp them we need to free ourselves from our mortality.

As Socrates tells us in no uncertain terms in the *Phaedo* the philosopher is someone who lives by striving to die. Plato nowhere mentions Democritus by name, a remarkable fact, but his intervention with the divine forms must have been made with him in mind.

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[1] Gregory Vlastos, "Reasons and Causes in the *Phaedo,*" in *Platonic Studies* (Princeton: Princeton University Press, 1973), 82.

[2] See Herbert Granger, "The Theologian Pherecydes of Syros and the Early Days of Natural Philosophy," in *Harvard Studies in Classical Philology* 103 (2007), 137.

[3] Felix Jacoby, *Die Fragmente der griechischen Historiker*, vol. 1, Fr1. (Leiden: Brill. 1961).

[4] Granger, 135.

[5] John Burnet, *Early Greek Philosophy*, 4th ed. (London: Macmillan; reprint New York: Meridian Books, 1957), 14. Vlastos quoted in Granger, p. 135.

[6] Francesca Rochberg, *The Heavenly Writing. Divination, Horoscopy, and Astronomy in Mesopotamian Culture* (Cambridge: Cambridge University Press, 2004), 8.

[7] Rochberg, x.

[8] Rochberg, xi.

[9] Rochberg, xii.

[10] Thomas S. Kuhn, *The Copernican Revolution* (Cambridge MA: Harvard University Press, 1957), 129.

[11] Quoted in Kuhn, 179.

[12] Kuhn, 130.

[13] Kuhn, 216.

[14] J. Kepler, *Harmonice Mundi*, cited in A. Koestler, *The Sleepwalkers* (New York: Grosset & Dunlap, 1963), 262.

[15] Plotinus, *Ennead* 2, 3. transl. S. McKenna (London: Faber, 1956), 96. Quoted in Rochberg, 2.

[16] Rochberg, 1.

[17] Rochberg, 19-20.

[18] Aristotle, *De Caelo* 292a; quoted in D.R. Dicks, *Early Greek Astronomy to Aristotle* (Ithaca: Cornell University Press, 1970), 167.

[19] Charles H. Kahn, *Anaximander and the Origins of Greek Cosmology* (New York: Columbia University Press, 1960), 166.

[20] Kahn, 7.

[21] Kahn, 80.

[22] Kahn, 77.

[23] Geoffrey Lloyd, *Magic, Reason and Experience* (Cambridge: Cambridge University Press, 1979), 230.

[24] Husserl, "Philosophy and the Crisis of European Humanity," in *The Crisis of European Sciences and Transcendental Phenomenology*, trans. David Carr (Evanston IL: Northwestern University Press, 1984), 283.

[25] W. S. Jones, *Hippocrates IV* (Cambridge MA: Harvard University Press, 1931), 226.

[26] Jones, 225-227.

[27] Quoted from Peter Scholz, "Philosophizing before Plato: on the social and political conditions of the composition of the *Dissoi Logoi,"* in W. Detel, A. Becker, & P. Scholz, eds., *Ideal and Culture of Knowledge in Plato* (Stuttgart: Franz Steiner Verlag, 2003), 220.

[28] Scholz, p. 223, citing T.Gomperz, *Griechische Denker I* (Berlin, 1922), 365.

[29] Scholz, 210, 33.

[30] Detel, Becker, & Scholz. My review can be found in *Bryn Mawr Classical Review* available at http://ccat.sas.upenn.edu/bmcr/2005/2005-10-28.html.

[31] Detel, Becker, & Scholz, 12.

[32] Detel, Becker & Scholz, 8.